Summary Minutes of the United States Environmental Protection Agency (U.S. EPA)
Science Advisory Board (SAB) Quality Review Teleconference
January 20, 2011

Meeting of the Chartered SAB and SAB Liaisons[1]

Date and Time: January 20, 2011, 12:00 p.m. – 3:00 p.m. Eastern Time

Location: By Teleconference

Purpose: To conduct a quality review of a draft SAB report entitled *Reactive Nitrogen in the United States; an Analysis of Inputs, Flows, Consequences, and Management Options: A Report of the EPA Science Advisory Board* (January 20, 2011 Draft)."[2]

SAB Members:

SAB Members

Dr. Deborah Swackhamer, Chair
Dr. David Allen
Dr. Claudia Benitez-Nelson
Dr. Ingrid Burke
Dr. Terry Daniel
Dr. Costel Denson
Dr. Otto Doering
Dr. David Dzombak
Dr. T. Taylor Eighmy
Dr. Bernd Kahn
Dr. Nancy Kim
Dr. Lee D. McMullen
Dr. Judith Meyer
Dr. James Mihelcic
Dr. Jana Milford
Dr. Horace Moo-Young
Dr. Eileen Murphy
Dr. Duncan Patten
Dr. Stephen Roberts
Dr. Amanda Rodewald
Dr. John Vena
Dr. Thomas Zoeller

Members of the SAB Integrated Nitrogen Committee:

Dr. James Galloway
Dr. Thomas Theis

SAB Staff Office Participants

Dr. Angela Nugent, Designated Federal Officer (DFO)
Dr. Anthony Maciorowski, Deputy Director
Dr. Thomas Armitage, Committee DFO

Members of the Public:

Ms. Bridgit DeCosmo, *Inside EPA*

Teleconference Summary:

The teleconference was announced in the Federal Register[3] and discussion generally followed the issues and timing as presented in the agenda.[4]

Convene the meeting

Dr. Angela Nugent, SAB DFO, convened the advisory teleconference and took roll. She stated that she had received no requests for oral public comments and that no written comments had been received.

Purpose of meeting and review of the agenda

Dr. Deborah Swackhamer, the SAB Chair, welcomed SAB members and noted that the purpose of the teleconference was to conduct a quality review of an original SAB study, which had received an initial quality review in September 2009 and had been substantially revised since then. She thanked Drs. James Galloway and Thomas Theis, past chair and vice-chair of the SAB Integrated Nitrogen Committee (INC), for their leadership and substantial contributions to the study and thanked Dr. Otto Doering, current INC chair for providing ongoing leadership for the completion of the report.

Overview of draft report

Dr. Otto Doering provided an overview of the draft report. He noted that the INC had been working actively for four years and commended the efforts of Drs. Galloway and Theis in developing the draft report. The topic is significant; as one lead reviewer commented, the National Academy of Sciences recently identified nitrogen as one of the major challenges for the 21st century. Not only has the report been submitted to quality review twice, but also has received external review from a blue ribbon panel in the spring of 2009 to provide a technical review. The INC revised the report to respond to those peer reviewers' comments and comments received for the 2009 SAB quality review[5].

Dr. Doering observed that the potential scope of the topic, integrated nitrogen, is vast. The scope of the report has been limited by the expertise of panel. He acknowledged that there were "clearly areas we did not cover," e.g., in-depth future projections for nitrogen and ecological condition.

He highlighted several major contributions of the report. First, the report provides a balance sheet describing reactive nitrogen in the environment and how these quantities relate to the nitrogen cascade. Table 2, page 11 provides this accounting based on data from 2002, the most recent year for which the INC identified consistent data. Second, the report describes how management of nitrogen must be treated as a cascade. This insight is especially important for EPA, given the Agency's traditional single media approach to risk management and research. Third, the report aims to provide a "multi-faceted audience" with details about the "reactive nitrogen baseline" and details about stocks and flows in areas where the INC had expertise. The report demonstrates the integrated nature of these flows and potential interdiction points and

identifies potential for control. Fourth, the report serves as primer on reactive nitrogen, providing broad and comprehensive background. Fifth, the report suggests research needs and risk management options.

Dr. Doering noted that the report is limited by the data available to the INC. The report's draft analysis is as "current as we can get it to 2010." If the report is not released soon, the analysis will be out of date. He noted that many comments from SAB members relate to additional points for the INC to address. He suggested that these comments may be seen as "jumping off points" for possible future analysis. In his view, the report provides a basis on which future work can go forward.

Chartered SAB Discussion

Dr. Swackhamer asked the lead reviewers to begin the SAB discussion by summarizing their significant comments.

Dr. Ingrid Burke, the first lead reviewer participating in the teleconference, commended the report for its attractive and well-organized format and for its thoroughness. She had not participated in the 2009 quality review and focused her remarks on the current draft. She also praised Chapter 2 for its review of nitrogen sources and transformations and noted that INC members might explore publishing that chapter in a peer-reviewed journal.

She noted that she had provided written comments and focused her oral remarks on the following areas where the report could be strengthened:

- Section 2.3.2 includes a discussion of estimates of nitrogen storage in terrestrial ecosystems but the estimates of carbon to nitrogen ratios have large uncertainties. Because the error is so high, it may not be appropriate to include the analysis. In addition, Finding 9 and Recommendation 9 do not seem substantiated by the preceding text.
- The literature citations supporting the terrestrial ecosystems sections are sparse and do not connect with the main argument.
- The Danish example discussed on page 21 focuses on how protein contents decline but yields are steady or increasing. The text discussion does not link logically to Finding 2 on page 22.
- For Figure 8, the Y axis should be yield, not nitrogen contribution.
- The report contains recommendations for policy and regulatory incentives for manure management but not for fertilizer use. She asked for reasons why the draft report did not include recommendations for policy and regulatory incentives for fertilizer use.
- The chapter 5 review of risk reduction strategies was broad ranging but contained only one recommendation and that recommendation did not relate to main points of the chapter. She asked that the imbalance be explained or remedied.

Dr. Terry Daniel, the second lead review participating in the teleconference, stated that his detailed written comments were available. He focused his oral comments on an overview of his review. He was impressed by the report and by its potential to motivate and lead the Agency.

He noted that it may be especially useful as a model for EPA in focusing on environmental protection as a priority as significant as human health risks.

He provided the following "overview comments" describing areas where the report should be strengthened:

- The report should emphasize the ecosystem services framework as way to remind readers of the value of environmental protection.
- The letter to the Administrator and the report should articulate that the nitrogen cascade and integrated management strongly reinforces ORD's transformation toward multi-media, multi-stressor approach.
- The report should more carefully examine the intended audience for different sections to edit sections where a high level of technical detail and numbers is inappropriate
- The report should be more consistent in striking an appropriate balance between science and policy recommendations. He suggested replacing the term "target goals" with language used elsewhere in the report, i.e., "actions that could be taken by EPA or other management authorities" to reduce excess reactive nitrogen in the environment.
- The executive summary contains the problematic term "target goals," which should be replaced. The executive summary also contains repetitive language, which should be consolidated and shortened.
- The report should include a figure like Figure 21earlier in the report
- Chapter 3 seems imbalanced. Most of the chapter concerns impacts on aquatic ecosystems, while air and terrestrial ecosystems are treated minimally. It may be appropriate to acknowledge this lack of balance explicitly or strengthen the discussion of impacts on air and terrestrial ecosystems.
- The report should explicitly address the implications of the recent regulations described in Appendix F and whether the impact of those regulations are reflected in the quantitative analyses presented in the report and whether and how they affect opportunities for nitrogen reductions described in the main body of the report.
- Chapter 6 should provide a more effective conclusion for the report, since the report is long and complicated. Chapter 6 presents new, detailed information, not presented earlier in the report.

Dr. David Dzomback, the third lead reviewer participating in the teleconference, noted that the INC report was an ambitious undertaking for the SAB and provides a unique synthesis looking at the "full scope of the reactive nitrogen problem and how EPA is organized to lead the country on it." The report, he believes, will be "foundational and stimulative for EPA and others" and "will help bring nitrogen management to the fore." He noted that he had provided written comments for consideration and had found no technical errors. He noted that the draft report should be revised to identify technical errors identified by others and to clarify language, where necessary. He urged the SAB to retain the current scope of the report and not expand it. He recommended that the SAB move forward to complete the report and commended the committee for its efforts.

Dr. Judith Meyer, the fourth lead reviewer participating in the teleconference, stated that she was impressed by the revised document, which was "vastly improved" since 2009. She noted that she had provided written comments calling for clarifications of language in the

document. Her only major substantive comment relates to language on page 85 concerning surface areas of streams and ditches. She asked that the reference to streams and ditches be removed.

After the conclusion of remarks from lead reviewers present at the teleconference, Dr. Swackhamer summarized comment from two other lead reviewers, Drs. Madhu Khanna and Catherine Kling, who had provided written comments but were unable to participate in the call. Dr. Swackhamer noted that they were attending a concurrent meeting of the SAB Environmental Economics Advisory Committee.

Dr. Swackhamer noted that Dr. Khanna complimented the report for being well-organized and readable. She summarized the following comments from Dr. Khanna describing areas where the report could be strengthened:

- The report should better justify the report's statement that the recommended management options will reduce reactive nitrogen by 25%. The report might provide a table or enhance Table 2 to show where reductions would occur. Such a table should be consistent with the Executive Summary
- Page 20-21 should better explain the potential for reducing nitrogen without reducing yield.
- The report should provide additional discussion of alternative biofuel technologies for improving efficiency, especially more discussion of alternative biofuel feedstocks.
- The report should add a recommendation to encourage EPA to use the Total Maximum Daily Load (TMDL) mechanism to achieve site-specific reductions in nitrogen emissions. This recommendation is important because nitrogen strategies are site-specific and not uniform across watersheds.
- The diagram in table 17 should be simplified or additional explanatory text added.

Dr. Swackhamer noted that Dr. Catherine Kling commended the revised report and the summary of changes made in response to the 2009 quality review. Dr. Kling asked that the report remove mention in the Executive Summary and Chapter 6 of the use of Clean Water State Revolving Funds to achieve a 25% reduction goal, because specification of the source of funds is not needed and is not a scientific finding. Dr. Kling also expressed a concern over the language used for target recommendations and noted inconsistencies across the report.

Dr. Swackhamer asked Dr. Doering, as INC chair, to respond to lead reviewer comments. Dr. Doering addressed each lead reviewer's comments in turn and asked Drs. Galloway and Galloway to also provide comments.

In regard to Dr. Burke's comments, Drs. Doering and Galloway gave the following responses:

- They will reexamine Table 2 and revise language in section 2.3.2 and Finding 9 to more appropriately characterize estimates of nitrogen storage in terrestrial ecosystems.
- They will strengthen citations supporting the terrestrial ecosystems text.
- They will clarify text on page 21 relating to the Danish case study and its link to Finding and Recommendation 9.

- They will revise Finding 9 to identify the need for better information about nitrogen inputs, storage, and outputs for terrestrial ecosystems because terrestrial nitrogen budgets are uncertain and will revise Recommendation 9 accordingly.
- They will explore why there isn't a recommendation on fertilizer management and possibly add a recommendation.
- They will provide more of a conclusion for chapter 5 and indicate how findings and recommendations elsewhere in the report relate to the text or provide additional findings and recommendations.

In regard to Dr. Daniel's comments, Drs. Doering, Galloway, and Theis gave the following responses:

- They will revise references to "target goals" to describe them consistently as "actions that could be taken by EPA or other management authorities to reduce excess reactive nitrogen in the environment."
- They will provide language better explaining how the committee derived the 25% reduction goals
- They will consider how best to characterize chapter 3, acknowledging that the text primarily addresses aquatic ecosystems or find a way to better balance consideration of aquatic, atmospheric, and terrestrial ecosystems.
- They will clarify and make explicit how Appendix F relates to the nitrogen calculations in the report.
- They will provide a summary section for Chapter 6.

Dr. Doering committed to making the changes identified in Dr. Dzomback's written comments and removing the reference on page 85 concerning surface areas of streams and ditches that concerned Dr. Meyer.

In regard to comments from Drs. Khanna and Kling, Dr. Doering gave the following responses:

- They will examine whether they can strengthen the rationale supporting findings related to management options to increase nitrogen use efficiency or clarify where the committee relied on expert judgment
- They will add language distinguishing different findings for alternative biofuel feedstocks and also identify uncertainties.
- They will consider Dr. Khanna's comments regarding TMDLs but are concerned that recommendations relating to TMDLs may not be helpful at this time because of current controversies surrounding TMDLs.

Dr. Swackhamer then asked other chartered SAB members to provide comments. Dr. David Allen commended the report and asked that the report be revised so that it does not call for NO_y to be considered as a replacement for the current NO_2 standard. Dr. Doering agreed to make this change. Dr. L.D. McMullen asked that the report revise Finding and Recommendation 20 on page 80 to address how the recommendation could be implemented without removing tillable agricultural land. Dr. McMullen suggested that the recommendation include *in situ* (e.g., wood chip) as well as end of pipe treatment. Dr. Doering agreed to consider including such language and asked Dr. McMullen to provide draft language.

Dr. Swackhamer also asked Dr. Doering to review Dr. Jana Milford's comments to correct technical errors and areas that needed clarification. Dr. Swackhamer identified the following additional points as common themes in members' quality review comments:

- Eliminate inconsistencies between language in the Executive Summary and Chapter 6.
- Include the cascade diagram with brief accompanying text in the Executive Summary to emphasize the report's key point about the importance of integration.

At the conclusion of the discussion by Board members, the SAB Chair asked for a motion for the disposition of the report, A Board member moved that the draft report be approved subject to changes suggested in members' written[6] and oral comments and re-review by the SAB Chair. The motion was seconded. Dr. Swackhamer asked for a voice vote to approve the motion. There was universal approval with no abstentions. The SAB Chair then congratulated Drs. Doering, Galloway, and Theis for their significant work. She committed to work with Dr. Doering and Dr. Thomas Armitage, the INC DFO, on revisions.

The chartered SAB then discussed briefly the communication strategy for releasing this original SAB report. The following ideas were discussed:

- The SAB Staff will take the lead in organizing briefings for the EPA Deputy Administrator, the EPA Science and Technology Policy Council, and the Hill and issuing a press release.
- The INC leadership will explore publishing a piece in the journal *Science* describing the report
- An INC member, Dr. Elizabeth Boyer, is exploring publishing a peer reviewed article on establishing the baseline for reactive nitrogen accounting.
- The journal *Environmental Science and Technology* may provide an appropriate venue for an article.
- Members suggested that the SAB Staff Office send a copy of the final report to the following groups and/or plan briefings for them:
    - U.S. Department of Agriculture
    - National Academy of Engineering
    - The science advisory boards at the National Oceanic and Atmospheric Administration and the National Aeronautics and Space Administration,
    - U.S. Geological Survey (Marcia McNutt's Office)
    - U.S. Forest Service
    - National Association of Wastewater Agencies
    - The Fertilizer Institute
    - Dairy groups
    - American Society of Civil Engineers
    - American Society of Chemical Engineers
    - National environmental groups concerned with water and air issues
    - Associations for local units of government
    - National Science Foundation
    - Water Environment Research Foundation

- INC members will seek opportunities to communicate about the INC report at upcoming professional meetings (e.g., AAAS meeting, February 2011, the Ecological Society of America, and the American Society of Limnology and Oceanography).

The SAB chair concluded the meeting with thanks to members for their review and comments.

The Designated Federal Officer adjourned the meeting at 1:45 p.m.

Respectfully Submitted:	Certified as True:
/signed/	*/signed/*
Dr. Angela Nugent	Dr. Deborah L. Swackhamer
SAB DFO	SAB Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned to not rely on the minutes represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

Materials Cited

The following meeting materials are available on the SAB Web site, http://www.epa.gov/sab, at the following address: http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/665963600b59af70852577ec00670804!OpenDocument&Date=2011-01-20

[1] Roster, Chartered SAB Members and Liaisons
[2] Draft report entitled "Reactive Nitrogen in the United States; an Analysis of Inputs, Flows, Consequences, and Management Options: A Report of the EPA Science Advisory Board (January 20, 2011 Draft)"
[3] Federal Register Notice Announcing the Meeting
[4] Agenda
[5] Summary of Revisions to Integrated Nitrogen Committee's Report in Response to Quality Review Comments from the Chartered Science Advisory Board.
[6] Compilation of members' written comments.